Foster-Miller
A QinetiQ Company

Guidelines for Rescue Chambers

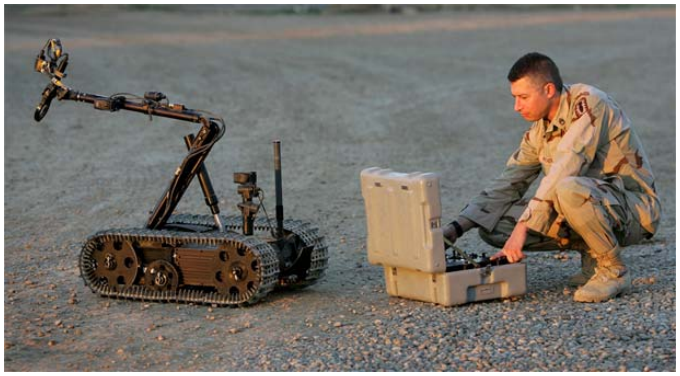
Randy Berry
Foster-Miller Inc.

Background

- Foster-Miller is a consulting engineering company, with extensive experience in:
  - Robotics
  - Instrumentation
  - Mine safety research
    - Ventilation studies
    - Emergency escape hoist guidelines
    - Escape system guidelines for metal/nonmetal mines
    - Guidelines for oxygen self-rescuers
    - Guidelines for rescue chambers

Background

- Foster-Miller is a consulting engineering company, with extensive experience in:
  - Robotics
  - Instrumentation
  - Mine safety research
    - Ventilation studies
    - Emergency escape hoist guidelines
    - Escape system guidelines for metal/nonmetal mines
    - Guidelines for oxygen self-rescuers
    - Guidelines for rescue chambers



Background

- Foster-Miller is a consulting engineering company, with extensive experience in:
  - Robotics
  - Instrumentation
  - Mine safety research
    - Ventilation studies
    - Emergency escape hoist guidelines
    - Escape system guidelines for metal/nonmetal mines
    - Guidelines for oxygen self-rescuers
    - Guidelines for rescue chambers

Foster-Miller
A QinetiQ Company

Summary of the Presentation

- Introduction
- General rescue chamber requirements
- Examples of rescue chamber designs
- Other considerations
- Location methodology
- Conclusions

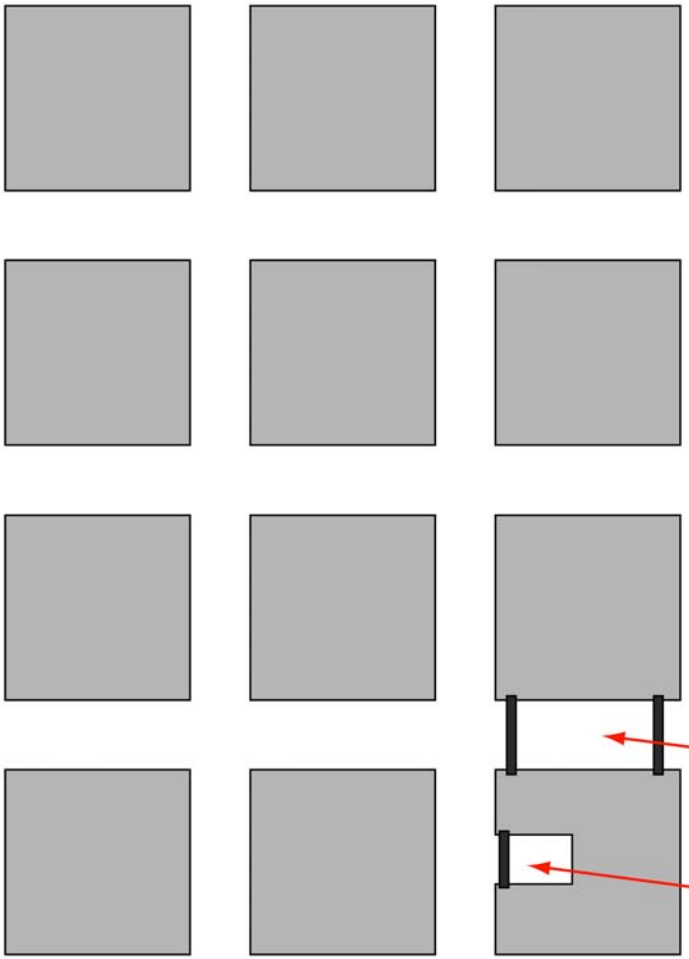
Introduction

- Rescue (refuge) chambers are a last resort option for trapped miners who have no escape options

General Rescue Chamber Requirements

- Mine specific
- Move-able and re-useable
- Explosion resistant
- Air supply
- Other considerations
  (supplies, where to locate, etc.)

Design of A Crosscut Rescue Chamber



- Required the development of a re-usable explosion-proof bulkhead

Two Part Project For Rescue Chamber Study

- Design, fabrication, and ***testing*** of explosion proof bulkhead(s) for use (and re-use) in a rescue chamber
- Development of guidelines

Key Components of An Explosion-Proof Bulkhead

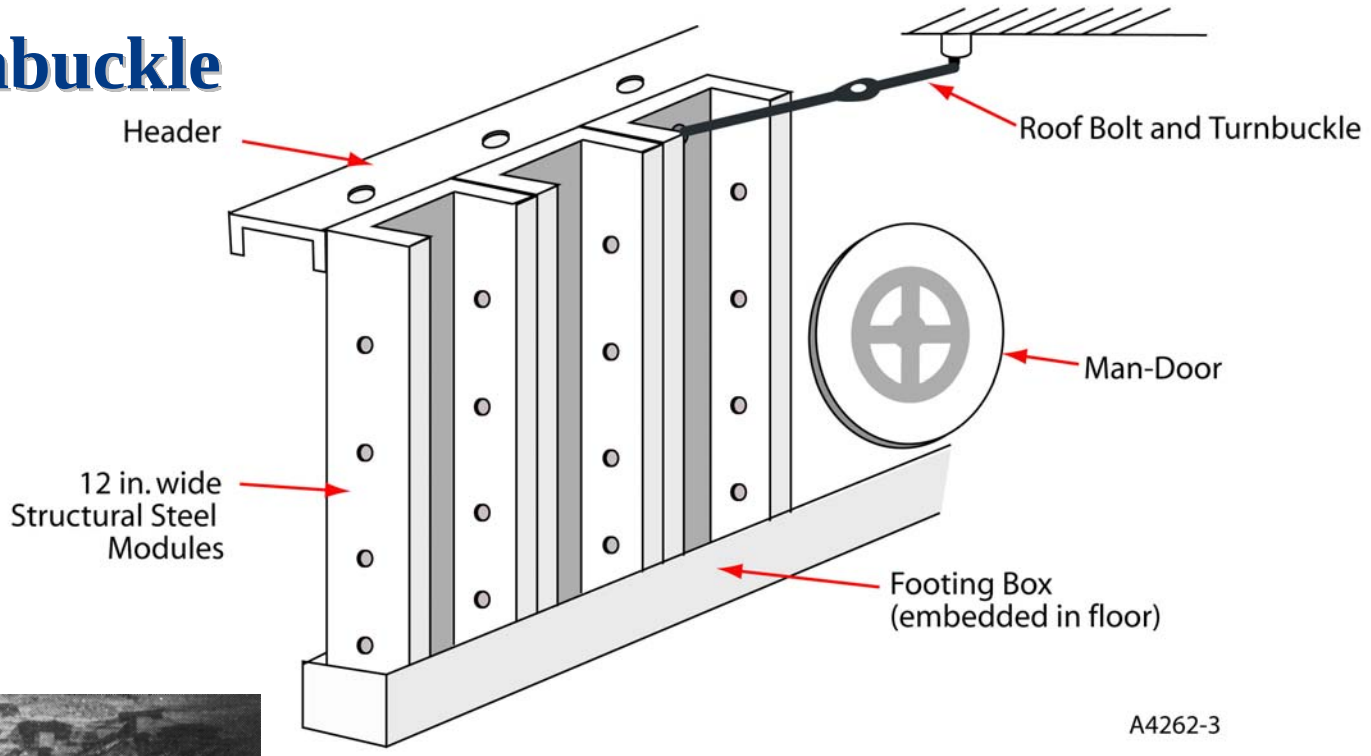
- The bulkhead
- Securing the bulkhead to ribs, roof, and floor
- Man-door
- Sealing around bulkhead perimeter

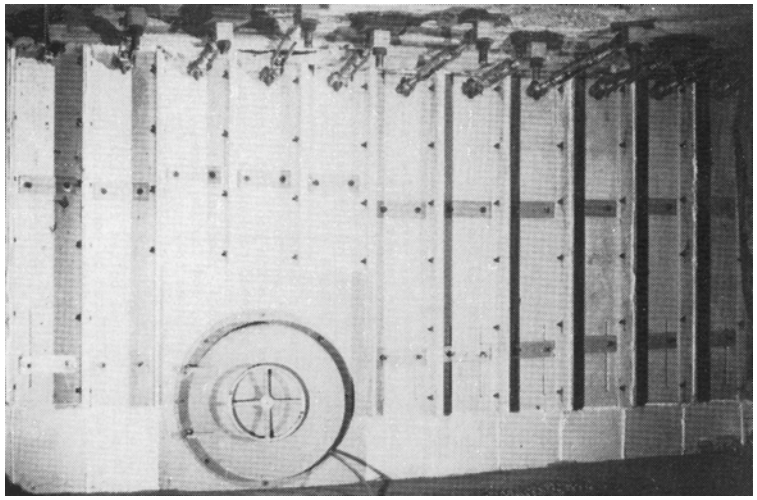
  Emphasis on using off-the-shelf materials

Mine Specific Designs

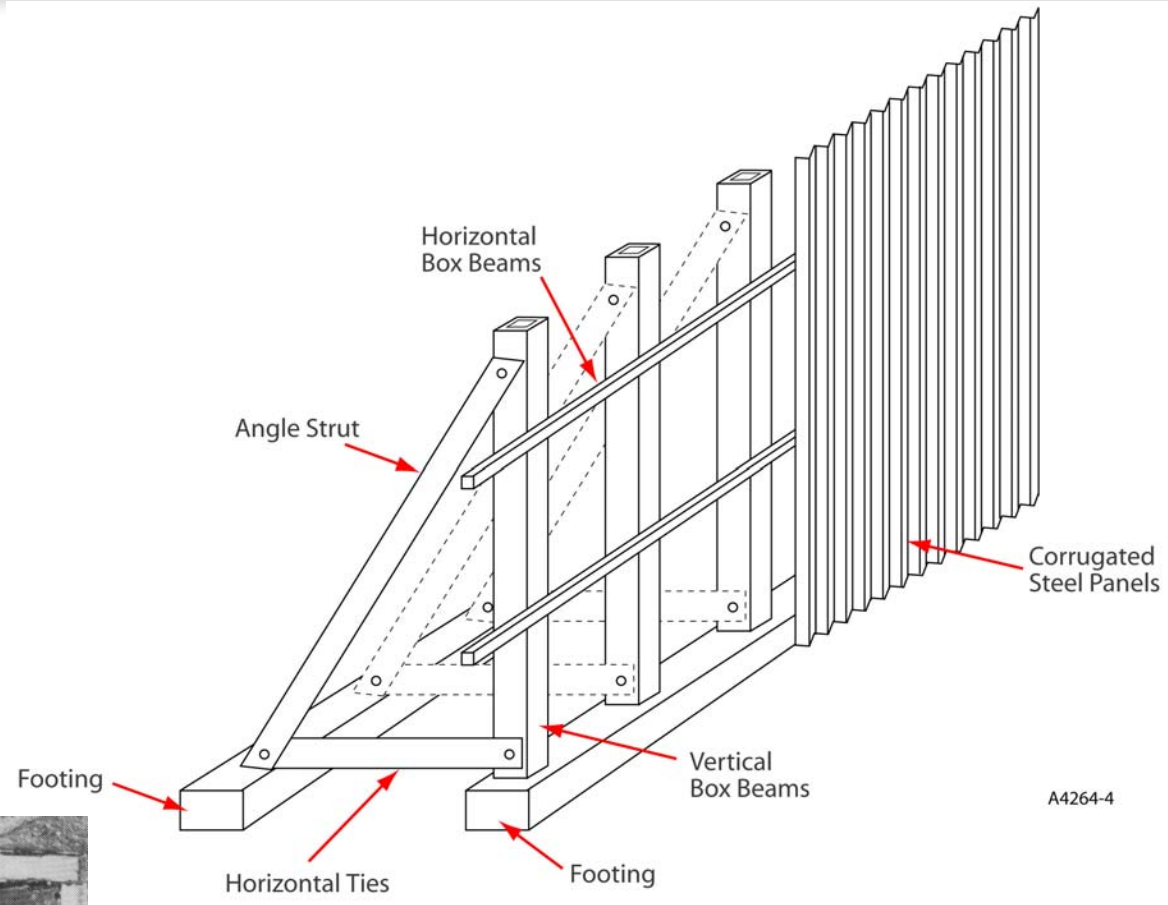
- Size of crosscut
- Competence of the surrounding strata

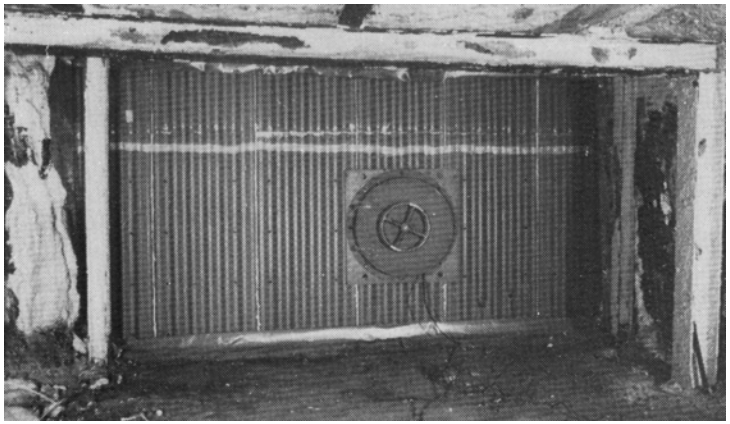
Design #1: Channel-Turnbuckle Bulkhead



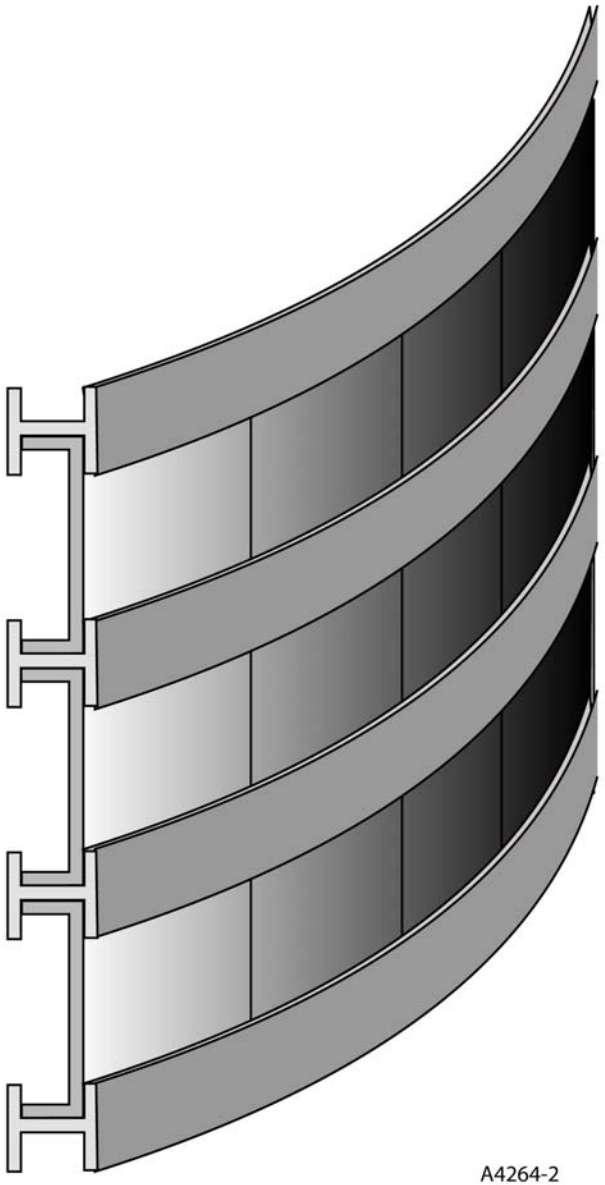


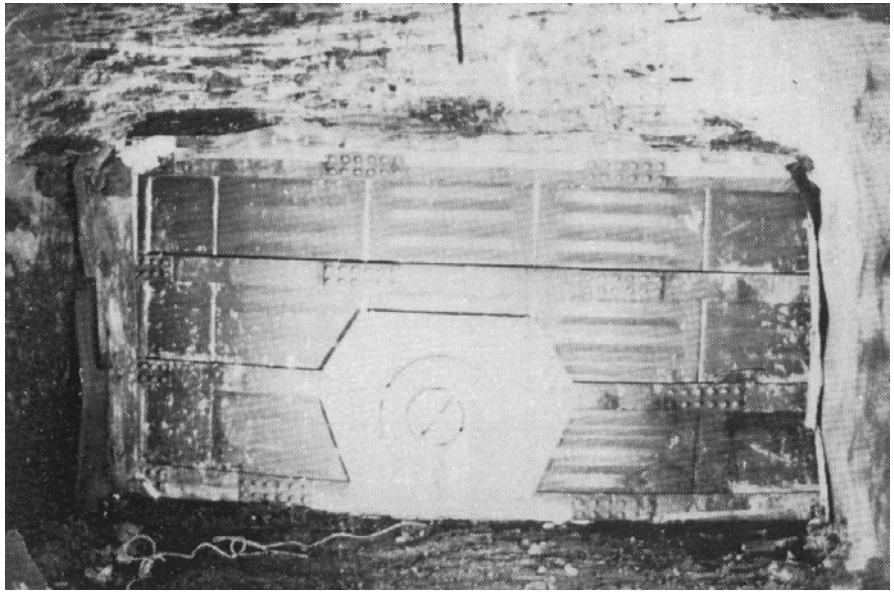
Design #2:
Truss Bulkhead





Design #3: Arch Bulkhead





Other Considerations

- Air supply (borehole preferred)
- Food and water
- Communications
- First aid
- Maintaining roof and rib support
- Ventilation during standby periods
- Choosing location(s)

Location Methodology

- Mine specific
- Flooding risk (pumps lose power)
- Surface access
- Within 1 hour of the face
- Locations along escape routes (and to store additional SCSRs)

Foster-Miller
A QinetiQ Company

Conclusions

- Rescue chambers have a place in an overall mine escapeway plan
- The rescue chamber concept is worth revisiting and updating
- New technology will play a role
  - SCSRs and other emergency breathing apparatus
  - Improved structural materials (strong, lightweight)
  - Improved sealants